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## Final Report

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# **Capture Rate Study: Medical Requirements for EPW**

## **Phase IV (Part 1)**

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For Purchase Orders

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## Introduction

The Enemy Prisoner of War Capture Rate Study is intended to develop estimations of capture rates for enemy prisoners of war (EPW). It is intended that these rates be incorporated into the Headquarters Department of the Army (HQDA) Total Army Analysis (TAA) process.

Historically, capture rates have been influenced by a variety of factors. These include posture (offensive or defensive), theater of combat, intensity of combat, outcome of the engagement, terrain, weather, force ratios, distance advanced or retreated, degree and extent of encirclements, logistics, duration of the campaign, existence of retreat routes, morale, and national characteristics. Usually, methods of calculating EPW capture rates have been based upon extracting and evaluating existing historical data.

This report addresses part of the fourth phase of the project, covering data on the medical condition and care of EPW. The analysis developed from Small Scale Contingencies (SSCs) will be presented under a separate cover.

This study does not address all of the issues relating to capture rates. Additional research should be done on a number of points. The number of civilian internees (including the number who need medical care), the number of refugees and non-interned civilians who might also provide a load upon military police and medical services, and the capture rates for units smaller than division (brigades, battalions and companies) should all be determined.

This report is mostly the work of Christopher A. Lawrence and Richard C. Anderson. Mr. Lawrence was the project manager and he developed the study plan under guidance from Jeff Hall at the Center for Army Analysis (CAA). Mr. Anderson assembled most of the medical data, except for Kursk, which was the work of Mr. Lawrence. Jay Karamales programmed the databases. The final report was written Mr. Anderson, with some of the analysis done by Mr. Lawrence. We also received help and support from Nicholas Krawciw, Stanley Miller (CAA), and Susan Rich.

## Study Plan

The EPW Capture Rate Study contract was originally split into three separately funded phases. In February 2000, after the completion of Phase I & II, it was decided to add an additional, fourth phase. Phase IV had the task of analyzing the medical experience of EPW; it was also decided to move the analysis of EPW in Small Scale Contingency Operations (SSCO) to this phase. The major tasks in Phase IV were:

- 1) Assemble 50 SSCO engagements from post-World War II.
- 2) Assemble EPW medical experience data.
- 3) Prepare Final Report addressing the SSCO and medical experience.

## Medical Requirements For EPW

### A. Medical Data

At an early stage in Phase IV it was realized that it would be impossible to create a database of EPW medical admissions matching the database created in the first three phases of the study. One of the common phrases used by U.S. Army G-2 officers summarizing EPW captures was "Not including prisoners reported through medical channels." Unfortunately, those relevant "medical channel" reports were normally rendered as weekly or monthly statistical summaries, rendering them useless in terms of the engagements in the database. These sources also do not identify the capturing unit, making it impossible in most cases to match the wounded or injured EPW with a particular engagement. As a result, it was decided to generate a set of medical statistics for EPW in a tabular format, rather than in a database as was done with our previous EPW work.

### B. Data Sources

The following sources were utilized for data on European Theater EPW medical experience:

**U.S. 90th Infantry Division G-3 Reports, G-2 Reports, Enemy Order of Battle Reports, and PW Interrogation Reports, 10 June - 31 August 1944.** These reports begin with the first commitment of the division in Normandy (at Orglandes, west of St. Mere-Eglise in the Cotentin Peninsula) and conclude with the division pursuing German forces east of Château Thierry. As in most divisions, the G-2 reports only occasionally give the number of EPW evacuated through medical channels—the number is usually expressed as "to date," rather than daily. The G-3 Reports give conflicting daily EPW figures and also give monthly medical figures.

**3rd (Canadian) Infantry Division Casualty Report, 6 June 1944.** This report includes the number of Canadian personnel (including the 1st Canadian Parachute Battalion of the 6th (UK) Airborne Division) killed, wounded, injured, missing, and captured on D-Day. The CIA are further subdivided into wounded and unwounded.

**U.S. II Corps After Action Report, 10 July - 17 August 1943.** This report gives the total number of hospital admissions in II Corps hospitals during the Sicilian Campaign. Numbers are given for U.S. Army (which would have included Army Air Forces personnel), U.S. Navy, allied, and enemy personnel admitted (by cause for U.S. personnel), remaining in hospital at the end of the period, and evacuated by the end of the period.

**First (British) Army Weekly Prisoner of War Summaries, 11 December 1942 - 28 May 1943.** These reports cover the Allied "Torch" landings on 8 November (the PW for the intervening period were summarized in the 11 December report) to the collapse and surrender of Axis forces in Tunisia. The reports give the number of EPW in theater in camps and in hospital on the given date and the number evacuated from theater hospitals and PW camps to date. The number of prisoners is further subdivided by nationality, as German or Italian.

**Fifth (U.S.) Army Daily Prisoner of War Reports and Reports of Prisoners of War Admitted to Fifth Army Hospitals, 1 - 4 June 1944.** These reports well illustrate the difficulty of matching the EPW medical data with the engagement database generated in Phase I & II. These reports are the only ones discovered that are extant in the archival record and appear to be fragments of a more complete file that was never archived in its entirety. The fragment includes daily summaries of Fifth Army casualties and EPW captured by division, and the number of medical admissions by Fifth Army hospitals, as was reported every four hours. Unfortunately, since it is impossible to match the hospital reports to the divisional reports, this set of data remains limited in its utility.

**12th (U.S.) Army Group G-1 Summaries, 9 December 1944 - 26 January 1945.** These reports give the total number of EPW captured by U.S. Army forces in the 12th Army Group zone. This appears to be the sole source for total EPW captured that can be matched to the SHAEF and European Theater of Operations Communications Zone (ETO Comm-Z) reports cited below.

**U.S. Army ETO Comm-Z Reports of Admissions to UK Hospitals, daily for 14 December 1944 - 17 January 1945, and weekly summaries beginning 15 December 1944 through 26 January 1945.** These reports give the total number of medical evacuations from the continent to the UK by sea and air. Patients are separated as U.S. Army (which would have included Army Air Forces personnel), U.S. Navy, Allied, Enemy and Civilian.

**SHAEF Report on Total Medical Evacuations to UK Hospitals, 17 - 20 December 1944, 21 December 1944 - 4 January 1945, 5 - 11 January 1945 and 12 - 20 January 1945.** A series of irregular reports. The cumulative totals for U.S. personnel evacuated were adjusted downwards twice for unknown reasons - by 1,885 on 20 December and by 1,733 on 11 January. The cumulative total of EPW was not adjusted.

In these tables, the time period and total PW are self-explanatory. However, the total PW casualties are those number reported to have been admitted to hospital or evacuated to hospital or by medical channels. Reports of PW medical casualties usually did not address the type or severity of the wound (in most cases neither did the reports of friendly casualties) and did not distinguish between wounded in action, non-battle injuries, or sick.

## EPW Medical Data

### U.S. 90th Infantry Division EPW as Derived from G-2 Reports

Period	Total EPW	Total EPW Casualties	Percent
10 - 15 Jun 1944	108	3	2.78
16 - 21 Jun 1944	430	37	8.6
22 - 30 Jun 1944	112	0	0
10 - 30 Jun 1944	650	40	6.15
1 - 10 Jul 1944	924	142	15.37
11 - 31 Jul 1944	271	40	14.76
1 - 31 Jul 1944	1,195	182	15.23
1 - 5 Aug 1944	1,229	7	0.57
6 - 23 Aug 1944	12,472	1,405	11.27
24 - 31 Aug 1944	347	0	0
1 - 31 Aug 1944	14,048	1,422	10.12
10 Jun - 31 Aug 1944	15,893	2,141	13.47

Unfortunately, as is remarked above, the number of EPW admitted to medical facilities was not always noted or specifically given. The total PW Medical numbers are based upon fragmentary or incomplete reporting, except that for 6 - 23 August. For the earlier periods, the totals are estimated, based upon the fragmentary data, but appear to be about 95 percent accurate. (As an example, the daily reporting could justify using a total of between 217 and 222 PW Medical for the

period 10 June–30 July 1944. The total of 222 was used because it appeared to most accurately reflect the reports.) As a comparison, the Division's G-3 Monthly Operations Summaries also give EPW and medical data (below).

It is also interesting to note that in the period 6–23 August, there was apparently at least one occasion when the 90th Division overran German medical facilities. On 20 August, the 4,380 EPW reported captured included 516 sick and wounded. It appears that the large proportion of wounded and sick PW captured 1–5 August may also be as the result of overrunning medical facilities. This raises the question of how great a burden on the captors medical facilities these EPW were, if they were captured with the doctors, nurses and medical equipment as well, which was often the case.

### EPW Medical Data

#### U.S. 90th Infantry Division EPW as Derived from G-3 Reports

Period	Total EPW	Total EPW Casualties	Percent
8 - 30 Jun 1944	967	71	7.34
1 - 31 Jul 1944	1,250	151	12.08
1 - 31 Aug 1944	16,092	1,665	10.35
1 - 30 Sep 1944	2,939	185	6.29
1 - 31 Oct 1944	369	20	5.42
8 Jun - 31 Oct 1944	21,617	2,092	9.68

### Comparison of U.S. 90th Infantry Division EPW

#### G-2 and G-3 Reports

Period	Total EPW	Total EPW Casualties
10 - 30 Jun 1944 G-2	650	40
8 - 30 Jun 1944 G-3	967	71
Difference	317	31
1 - 31 Jul 1944 G-2	1,195	182
1 - 31 Jul 1944 G-3	1,250	151
Difference	55	31
1 - 31 Aug G-2 1944	14,048	1,422
1 - 31 Aug 1944 G-3	16,092	1,665
Difference	2,044	243
10 Jun - 31 Aug 1944	15,893	2,141
15 Jun - 31 Oct G-3 1944	18,309	1,887
Difference	2,416	254

It appears that all of the differences in the two report sources are caused by the fact that the G-2 Reports were assembled from daily data, while the G-3 Reports were summaries of monthly activity, based upon the same—but corrected—daily reports. It appears that the EPW medical reported in the G-2 Reports is the same as that found in the G-3 Reports, the differences being caused by late reporting. The differences in the number of EPW are largely factors of the failure (in June 1944) to enter complete counts of EPW in the first early and confusing days of the Division's entry into combat. The similarly large error found in the August reports is from a similar cause. In this case, the error was caused by the difficulty of executing a timely and accurate count of EPW captured in the breakout from the lodgment area and the Battle of the Falaise Pocket.



### 3rd (Canadian) Infantry Division Casualty Report

Period	Total EPW	Total EPW Casualties	Percent
6 Jun 1944	47	2	4.26

### 1st (Canadian) Parachute Battalion Casualty Report

Period	Total EPW	Total EPW Casualties	Percent
6 Jun 1944	84	6	7.14

### U.S. II Corps After Action Report

Period	Total EPW	Total EPW Casualties	Percent
10 Jul - 17 Aug 1943	29,514*	645	2.19

### First (British) Army Weekly Prisoner of War Summaries (Italian EPW)

Period	Total EPW	Total EPW Casualties	Percent
8 Nov - 11 Dec 1942	369	18	4.88
12 - 18 Dec 1942	24	0	0.00
19 - 25 Dec 1942	7	2	28.57
26 Dec 1942 - 1 Jan 1943	3	0	0.00
2 - 15 Jan 1943	0	0	0.00
16 - 22 Jan 1943	105	7	6.67
23 - 29 Jan 1943	4	0	0.00
30 Jan - 5 Feb 1943	71	0	0.00
6 - 12 Feb 1943	95	0	0.00
13 - 19 Feb 1943	54	2	3.70
20 - 26 Feb 1943	120	2	1.67
27 Feb - 5 Mar 1943	229	12	5.24
6 - 26 Mar 1943	429	1	0.23
26 Mar - 2 Apr 1943	3	3	100.00
3 - 9 Apr 1943	637	37	5.81
10 - 16 Apr 1943	22	4	18.18
17 - 23 Apr 1943	33	30	90.91
24 - 30 Apr 1943	553	6	1.08
1 - 7 May 1943	150	5	3.33
8 - 14 May 1943	19	12	63.16
15 - 21 May 1943	261	59	22.61
21 - 28 May 1943	774	138	17.83
8 Nov 1942 - 28 May 1943	3,862	338	8.75

Italian EPW occupied an average of 28.17 hospital beds per week (over the 23 weeks where this data is known). The evacuation out of theater of sick and wounded Italian EPW was an average of 7.14 per week over the 28 weeks 8 Nov 1942-28 May 1943. Note that the week of 8-14 May 1943 was somewhat anomalous because, although only 19 EPW were captured, 28 were medically evacuated—7 from hospital and 9 from the PW camps and 12 directly from the new captures.

\* 2,358 German and 27,156 Italian EPW. The nationality of the medical EPW is unknown.

# **First (British) Army Weekly Prisoner of War Summaries** (German EPW)

Period	Total EPW	Total EPW Casualties	Percent
8 Nov - 11 Dec 1942	196	35	17.86
12 - 18 Dec 1942	60	17	28.33
19 - 25 Dec 1942	45	10	22.22
26 Dec 1942 - 1 Jan 1943	22	8	36.36
2 - 15 Jan 1943	57	10	17.54
16 - 29 Jan 1943	48	7	14.58
30 Jan - 5 Feb 1943	33	0	0.00
6 - 12 Feb 1943	106	12	11.32
13 - 19 Feb 1943	26	0	0.00
20 - 26 Feb 1943	16	0	0.00
27 Feb - 5 Mar 1943	72	72	100.00
6 - 26 Mar 1943	817	127	15.54
27 Mar - 2 Apr 1943	16	3	18.75
3 - 9 Apr 1943	60	1	1.67
10 - 16 Apr 1943	314	48	15.29
17 - 23 Apr 1943	252	103	40.87
24 - 30 Apr 1943	656	159	24.24
1 - 7 May 1943	242	101	41.74
8 - 14 May 1943	459	47	10.24
15 - 21 May 1943	1,128	591	52.39
8 Nov 1942 - 28 May 1943	4,618	1,351	29.26

German EPW occupied an average of 172.35 hospital beds per week (over the 20 weeks where this data is known). The evacuation out of theater of sick and wounded German EPW was 14.04 per week over the 27 weeks 8 Nov 1942 - 21 May 1943.

**Fifth (U.S.) Army Daily Prisoner of War Reports  
and Reports of Prisoners of War Admitted to Fifth Army Hospitals**

Period	Total EPW	Total EPW Casualties	Percent
23 May - 1 June 1944	5,294	473	8.93
1-Jun-44	470	46	9.79
2-Jun-44	1,240	87	7.02
23 May - 2 Jun	7,004	606	8.65

**12th (U.S.) Army Group G-1 Summaries of EPW Captured  
and U.S. Army ETO Comm-Z Reports of Admissions to UK Hospitals**

Period	Total EPW	Total EPW Casualties	Percent
9 - 15 Dec 1944	7,373	363	4.92
16 - 22 Dec 1944	8,176	515	6.30
23 - 29 Dec 1944	10,440	50	0.48
30 Dec 44 - 5 Jan 45	6,823	50	0.73
6 - 12 Jan 1945	8,503	245	2.88
13 - 19 Jan 1945	8,206	10	0.12
20 - 26 Jan 1945	7,001	0	0.00
9 Dec 44 - 26 Jan 45	56,522	1,233	2.18

**12th (U.S.) Army Group G-1 Summaries of EPW Captured  
and SHAEF Report of Evacuations**

Period	Total EPW	Total EPW Casualties	Percent
17 - 20 Dec 1944	5,496	279	5.08
21 Dec 44 - 4 Jan 45	16,938	526	3.11
5 - 11 Jan 1945	6,669	682	10.23
12 - 20 Jan 1945	12,371	977	7.90
17 Dec 44 - 20 Jan 45	41,474	2,464	5.94

These two sets of 12th (U.S.) Army Group data are from similar reports. Unfortunately, these medical reports are only for personnel (friendly and enemy) evacuated from the continent, and do not include hospitalizations on the continent. Thus, neither those EPW medical in the combat zone nor those for the communications zone are included. Note that the EPW figures are derived from a single source and are consistent, the reason for the large difference in the medical evacuations in what are otherwise similar reports, is unknown.

**C. EPW Medical Experience as a Fraction of Total Medical Experience**

In many of these cases, it is possible to identify the number of Allied casualties that were treated within the same time frame as the EPW casualties. In these tables Friendly Casualties may include wounded, battle injuries, sick, combat exhaustion, and died of wounds (DOW).

### U.S. 90th Infantry Division Friendly and EPW Casualties as Derived from G-3 Reports

Period	Friendly Casualties	PW Casualties	Ratio
8 - 30 Jun 1944	3,143	71	44.27:1
1 - 31 Jul 1944	4,480	151	29.67:1
1 - 31 Aug 1944	1,710	1,665	1.03:1
1 - 30 Sep 1944	2,016	185	10.90:1
1 - 31 Oct 1944	1,609	20	80.45:1
8 Jun - 31 Oct 1944	12,958	2,092	6.19:1

### U.S. II Corps After Action Report

Period	Friendly Casualties	PW Casualties	Ratio
10 Jul - 17 Aug 1943	11,415	645	17.70:1

### Fifth (U.S.) Army Daily Prisoner of War Reports and Reports of Prisoners of War Admitted to Fifth Army Hospitals

Period	Friendly Casualties	PW Casualties	Ratio
23 May - 1 June 1944	6,637	473	15.19:1
1-Jun-44	1,141	46	24.80:1
2-Jun-44	697	87	8.01:1
23 May - 2 Jun	8,475	606	13.98:1

### 12th (U.S.) Army Group G-1 Summaries of EPW Captured and U.S. Army ETO Comm-Z Reports of Admissions to UK Hospitals

Period	Friendly Casualties	PW Casualties	Ratio
9 - 15 Dec 1944	10,063	363	27.72:1
16 - 22 Dec 1944	3,261	515	6.33:1
23 - 29 Dec 1944	9,959	50	199.18:1
30 Dec 44 - 5 Jan 45	11,540	50	230.80:1
6 - 12 Jan 1945	6,606	245	26.96:1
13 - 19 Jan 1945	6,261	10	626.10:1
20 - 26 Jan 1945	13,173	0	0.00:1
9 Dec 44 - 26 Jan 45	60,863	1,233	49.36:1

excesses of the German Armed Forces. At the same time the worsening weather made evacuations, and particularly air evacuations, more difficult). Overall it appears that the load on medical facilities caused by EPW, was approximately 5.65 to 16.16 percent of the load caused by friendly casualties.

### D. Kursk Data

From 4 to 18 July 1943 the 4th Panzer Army and Provisional Army Kempf conducted offensive operations east and north of Belgorod as part of the Battle of Kursk. During the campaign the Germans captured large numbers of Soviet soldiers. The Germans established special EPW camps before the operation and even had a hospital organized exclusively for the treatment of EPW.

It is difficult to determine from this data whether or not EPW were a major load on medical facilities. The data from the 12th (U.S.) Army Group sources would indicate that EPW casualties varied from being a minor factor, to being insignificant. However, it must be remembered that these evacuations were from the European Continent to England, and usually involved only the most severe casualties. Furthermore, it appears that, at least at the end of the period cited, a lower priority may have been assigned to the evacuation of EPW casualties. (This was the time of the German Ardennes Offensive—the Battle of the Bulge—and feelings against German PW were running high among the Allies as a result of the "Malmédy Massacre" and other

A report by "Korück 585," a rear-area headquarters of 4th Panzer Army responsible for EPW, gave details on EPW for the period of the battle. There were 501 EPW on hand on 4 July. Between 4 and 28 July an additional 16,557 were captured (156 of which were listed as "otherwise absent," apparently meaning they were unaccounted for). By 29 July 1,905 had been assigned to the responsibility of other units, 7,541 had been shipped to the rear, and 7,612 were still on hand. This report only applied to the Fourth Panzer Army. Of the 7,612 prisoners still held on 29 July, 2,203 had been assigned as volunteers to German units<sup>1</sup>, leaving 5,409 in PW camps.

Of the 16,557 EPW the Germans reported that 2,794 were wounded. They also reported that 31 of the 501 on hand on 4 July were also wounded. Of these wounded, 25 died. As of 29 July, only 75 wounded prisoners remained. Among the wounded were 39 officers (from a total of 607 officers captured between 4 and 28 July).

#### **Soviet EPW Captured by the 4<sup>th</sup> Panzer Army at Kursk**

	<b>Total Captured</b>	<b>Total Wounded</b>	<b>Died of Wounds</b>
Total Troops	16,557	2,794 (16.88%)	25 (0.89%)
Officers only	607	39 (6.43%)	--

As an aside, the total number of deserters from this population was 2,130 (including 85 officers). This means that deserters made up 12.86 percent of these EPW, and that 14.00 percent of the deserters were officers. The higher desertion rate among officers overall and the officers' lower rate of wounds as related to the EPW as a whole is surprising.

To confirm the validity of these statistics, there is also a report showing the date, train number, and a count of the EPW transported. It confirms that 529 officers were transported to the rear (out of 607), and that 33 of these were wounded (out of 39). It also shows that 7,012 enlisted men and non-coms were transported to the rear (out of 16,557) and that 2,692 of these were wounded (out of 2,755 wounded, of whom 25 died).

Other reports of prisoner transports in the TDI Kursk files include lists of prisoners transported by train, truck, and foot. While a significant number were transported by foot (5,184 from 7 to 27 July), there were no wounded among them. They do report transporting from 10 May to 31 July a total of 15,754 POWs (481 officers), of which 2,055 were wounded (25 officers). In this case 13.04 percent of the prisoners were wounded.

Provisional Army Kempf reported 12,102 captured for 5 to 24 July, but no report on the number of wounded prisoner was found.

The low died-of-wounds rate among these EPW most likely was due to a significant percent of the severely wounded EPW dying before they reached an aid station. Died-of-wounds rates typically run between two and four percent (the U.S. Army rate in World War II was four percent, in Korea it was 2.5 percent, and in Vietnam it was 3.4 percent). A higher died-of-wounds rate may indicate either poorer medical care or a very quick evacuation rate. A lower died-of-wounds rate may indicate either better medical care or a slower evacuation system.

However, died-of-wounds rates are not always an indicator of quality of medical care or first aid. Rather, it is often an indicator of the speed of evacuation, with quicker evacuation inflating the died-of-wounds rate (and vice versa). Interviews with two Soviet veterans of the battle indicate that they

<sup>1</sup> Known as Hilfswilligers or Hiwis, these volunteers were utilized as labor and service personnel in German units, freeing Germanic personnel for combat service.

walked to the prisoner of war camps for some distance.<sup>2</sup> One of them stated that several prisoners were executed out of 100, and later when transported back to Poland by rail, seven out of 70-80 died. Although some of the prisoners may have been executed on the way back, the fact that a died-of-wounds rate among the prisoners (0.89 percent) was even recorded indicates that severely wounded cases did make it to the rear. And that implies that some sort of medical care, however minimal, was provided to the EPW (as a comparison, the British died-of-wounds rate in the Falklands, where evacuation was very slow, was 1.4 percent). The number of EPW executed was most likely fewer than 10 percent of the total EPW captured, and probably was much less than that.

An estimate of the total workload imposed on the German medical facilities by the EPW can be calculated. If 2,794 wounded EPW were captured by the 4th Panzer Army, and if they made up 16.88 percent of the captured, then the wounded among the 12,102 captured by the Provisional Army Kempf would have been 2,042. From 4 to 18 July (which is certainly the period when 95 to 99 percent of the prisoners were captured) the Germans suffered 27,609 wounded. This means that the enemy wounded comprised 14.91 percent of the total German medical workload. However, there is reason to believe that the Soviet wounded were not always afforded the same quality or priority of care, or facilities as the German wounded.

## **E. Data for U.S. and UK Wounded EPW and Post-World War II**

Unfortunately, most of the reliable data we have gathered was for German EPW captured by American or Commonwealth forces. The primary reason for this is that the U.S. and UK tended to have better records. As such, we have been able to locate some reports of the number of wounded EPW in the U.S. and UK records. Unfortunately, this skews the data, as these rates are more properly wounded rates for German EPW captured by the U.S. and UK. Few references to wounded US PW were found. In the course of this project we perused a large number of German records, searching for records addressing wounded U.S. and UK EPW. However, it appears that reports on the percentage of U.S. and UK EPW wounded—similar to that found for Soviet EPW at Kursk—are not available. This may be because the records were not kept or because they were simply lost.

The sole reference we have been able to discover regarding wounded U.S. EPW was found in the History of the U.S. Army Medical Service in World War II. There it is noted that of the first 12,000 U.S. PW returned to Army control at the end of the war, 18 percent required hospitalization. In most cases, this was due to malnutrition and disease, rather than wounds, and as such it is not a good measurement of the number of wounded PW requiring medical care.

The only data for U.S. wounded EPW from the Korea War date from 1953 when there were two EPW exchanges with the Chinese and North Koreans. This first was of 149 U.S. personnel (of whom 147 medical records survived) who were in need of immediate medical treatment. The second consisted of 3,596 US military personnel (of whom 3,585 medical records survived). Of the first group 145 of the 147 with medical records (98.64 percent) had been wounded before. Of the second group 61.5 percent of those with medical records had been wounded before. However, it is not known if these wounds occurred (and healed) well before capture or were incurred during captivity. Surgical operations were conducted in captivity on 618 of these cases (17 percent). There were a small number (21) of Americans who refused repatriation.

This data would indicate that somewhere between 17 to 61.5 percent of the captured U.S. prisoners were wounded. This data is certainly biased by the fact that we do not know when the wound occurred (at an unrelated earlier date, just prior to capture, or during captivity). Furthermore, it is clear

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<sup>2</sup> Veterans interviewed were Captain Tihon Petrovich Chervov and Private Ilirion Stepanovich Beskov. They were interviewed in 1998-1999 by a team assembled by Col. Fyodor Sverdlov. Both were captured by the Fourth Panzer Army on 5 July 1943 and spent the war in German prison camps and spent over a decade in the post-war period in Soviet labor camps because they had surrendered.

that "carded for record only" and lightly wounded EPW are not included in the other examples of EPW medical care cited in this report. In light of the politically sensitive nature of the Korean War prisoner exchange, certainly even minor wounds were carefully recorded. This means that this data is probably not directly comparable to the other data cited in this report. Finally, the Korean War data is further skewed by the large number of missing in action in the Korea War and the generally poor treatment of U.S. prisoners by the North Koreans and Chinese. Of the 10,218 missing in action, 7,140 were captured. Of these, only 4,418 were returned while 21 refused repatriation. This means that 38 percent of those reported captured died in PW camps.

Oddly enough, there is also little usable statistical data from the Gulf War. This appears to be due at least in part to the criticism of the U.S. Army over body counts in the Vietnam War. The Army leadership made it clear on numerous occasions in the Gulf War that the war would not be dependent on body counts. As a consequence good statistical data on enemy losses were not maintained.

The only relevant data for the Gulf War that has been discovered so far is the diary of the 807th MASH (Mobile Army Surgical Hospital). Brian Ginn, who was apparently a member of the unit, wrote this well after the war, evidently from notes he made at the time. It is not an official U.S. Army record.

The 807th was the northernmost MASH deployed with the VII Corps. It followed directly behind the 1st (UK) Armored Division during the ground war. The 807th was in operation for 120 hours during that time and treated 42 American and 34 Iraqi casualties. Two of the American casualties died of wounds.

The 807th re-established operations on 12 March to handle U.S. troops, refugees and civilians, treating many casualties caused by unexploded ordnance and mines, as well as casualties inflicted in the fighting between rebellious Iraqi civilians and the Iraqi Army in the Fao Peninsula. By 10 April (after 30 additional days of operation) the hospital had admitted 1,007 patients, including 785 U.S. personnel, 209 civilians, and 13 Iraqi EPW. The 807th had assisted with four births, while only eight patients had died (six were children and two were U.S. military). It is noted that the 807th was more stressed by the post-war workload than they were at any time during the war. There were never more than 70 beds in operation at any one time by the 807th MASH.

## **F. Pre-World War II**

While TDI originally did not intend to review pre-World War II data, some was discovered in the process of reviewing sources while compiling this report. We present it here with minimal comment.

In the U.S. Civil War during U.S. Grant's Overland Campaign from 5 May to 12 June 1864, the Confederate Army of Northern Virginia, commanded by General Robert E. Lee, lost 10,180 MIA and unwounded PW. A total of 861 wounded PW were captured by Union forces, which would mean that 7.8 percent of the total MIA and PW were wounded. The author of this article estimated that about 95 percent of the reported MIA were actually captured or 9,671, yielding 9.8 percent wounded.<sup>3</sup> However, based on the EPW data collected to date, TDI considers that 95 percent may be high, but it is likely that not less than 75 percent of the MIA were captured. In that case 10.13 percent of the PW were wounded. However the calculation is made, this data falls well within the range normally found for World War II data.

<sup>3</sup> Data and estimate from "Numbers and Losses in the Army of Northern Virginia," by Alfred C. Young, III in *North and South: the Official Magazine of the Civil War Society*, Vol. 3, No. 3, pp. 26-27.

## Chapter 4

# Measuring Human Factors In Combat

Armed forces do not all fight with the same degree of effectiveness. Their performance and capabilities in battle can and do vary widely. The differences go far beyond the numbers, mix, and capabilities of the weapons brought onto the field of battle. There are entire ranges of "force multipliers" that are related to the performance of human beings (and groups of human beings) on the battlefield. These force multipliers, referred to by the Dupuy Institute as "Combat Effectiveness," include such factors as leadership, generalship, training, experience, morale, motivation, cohesion, intelligence (including interpretation), momentum, initiative, doctrine, the effects of surprise, logistical systems, organizational habits, and even cultural differences. Human factors are hard to measure. As such, the analytical community often ignores them.

For this study, it is impossible to ignore such issues as morale, motivation, and cohesion. These components of "Combat Effectiveness" have an effect on both combat capability and EPW capture rates. One would expect more personnel to surrender in a force with lower morale, motivation, and cohesion (less combat effectiveness), than in one with higher morale, motivation, and cohesion (more combat effectiveness).

In Phases I & II of this study, we cited a few possible ways to measure this combat effectiveness difference. These ways included measuring mission accomplishment, casualty effectiveness, and/or spatial effectiveness. It appears from the somewhat fragmentary data assembled for EPW medical experience in this report that relative injury rates of PW may be another, and possibly more timely, measure of combat effectiveness.

In the experience of the First (British) Army in Tunisia, it was found that over a period of nearly seven months, the intake of German prisoners requiring medical attention was over three times the rate of that for Italian prisoners. That is, of the total number of German prisoners, 29.26 percent required medical attention, while for the Italians it was only 8.75 percent. This rate does not appear to be an anomaly: both the German and Italian experience show at least one peak period where 100 percent of the prisoners required medical attention (although it was 3 of 3 for the Italians and 72 of 72 for the Germans). The total number of PW is also similar: 3,862 Italians and 4,618 Germans. Furthermore, there does not appear to have been an imbalance between the German and Italian contributions in this campaign. The two were fighting side by side, in similar terrain and circumstances, with similar numbers of men and equipment, and they faced the same opposition.

It appears that the German soldiers in North Africa, despite a near hopeless situation, fought on until wounded more often than did the Italians. This may be a psychological factor, although one could question why the Italian soldier had a more realistic evaluation of his situation than did the German soldier. It may be a question of morale and cohesion. However, whatever the cause, it appears that there was a measurable effect.

Note that this result appears to match the findings of Phases I & II. In the Campaign Database of Phases I & II it can be clearly seen that the British consistently outperformed the Italians, while the



Germans consistently outperformed the British, in terms of casualty effectiveness and mission accomplishment.

This phenomenon calls for more thorough analysis, for the percent of surrendered who are wounded may serve as the basis for being able to measure or estimate human factors, morale, motivation, unit cohesion, etc.

Still, having a "less capable force"—when "less capable" is defined as the Soviet Union—does not necessary always mean that the percent of wounded EPW would be lower than for a "Modern, Motivated Army." It is notable that 17 percent of the prisoners of war captured by the German 4th Panzer Army from 4 to 28 July were wounded. This is higher than many of the figures found for German wounded EPW. As such, it can be surmised that the weakness of the Soviet Army (see the Phase I & II Final Report for a discussion establishing this lower level of performance) was not primarily due to a lack of motivation, but was due to the other factors that make up human factors.

## Analysis

There are three ways to measure the workload created by EPW. First is to measure the percent of EPW captured that require medical treatment. This data was easy to gather and is supported by the historical record. Second is to measure the percent of casualties treated that are EPW. This data also was easy to gather and is also supported by the historical record. Third is to base the number of wounded EPW upon a proportion of the force of which they were a part. While this was the methodology chosen in Phases I, II, and III of this project, for a number of reasons it was not chosen for Phase IV.

The reasons for this vary. First and foremost, it was unnecessary. Since the overall EPW capture rates were already formulated in Phases I, II, and III, creating a simple table to determine the percent of the EPW that were wounded would suffice for most purposes. This approach is relatively simplistic and does suffer in that it prevents a more sophisticated analysis of other factors, conditions of combat, outcomes, and so on, that may influence the wounded rates. The most significant analysis that is missing is that relating combat outcome to the percent of CIA that are wounded. As it is suspected that these correlate, this will be explored in some depth later in this section. The possible alternate method was to assign another field in the database (of 202 World War II engagements) to the percent wounded for each engagement and to then expend the considerable additional time and effort in an attempt to fill them.

Second, this was not done because records connecting the actual number of wounded EPW to a particular enemy unit or engagement are limited and are difficult to extract from the record. In fact after considerable research it was obvious that we would not have 202 complete cases to test the data to. For example, there are no reports in the German records from Kursk that match the number of wounded EPW to any of the Soviet units or engagements. The same is pretty much true of almost all of the Ardennes engagements and many of the Italian engagements. As a result, considerable effort would be expended attempting this. And, even with luck, the data could only be completed for 20 to 30 of the 202 engagements.

Third, and related to the second point, was budget. An effort to tie the number of wounded to the total CIA population by engagement would have increased the cost for this phase by an order of magnitude. Such a budget, in view of the known difficulty in finding the data, would not have been justified.

Thus, the analysis will focus on developing two figures. One will be the percent of CIA that are wounded, which will be our main measure. The other will be the percent of the total of the treated wounded that are EPW, which will be an ancillary calculation.

We will also attempt to analyze two other relevant factors. First is whether or not human factors help determine the percent of CIA that are wounded. Second is whether or not the number of CIA (measured either as a percent of the enemy force, as a number per month, or as an increase or decrease from a previous time period) influences the percent of captured that are wounded. This partly addresses the issue of the effect outcome has on the percent of CIA who are wounded.

One of the problems in this analysis is that no one really knows what the precise meaning of "wounded in action" is. "Killed in action" is fairly well understood, although killed figures are somewhat muddled by including those who died of wounds in medical facilities. "Captured" is also fairly well understood.

However, the number of wounded in action (including all those who require medical care) is very much driven by the particular definition in use by the army in question and is sometimes influenced by individual interpretations by the units recording the medical data, and sometimes by the data recorders themselves. Simply put, not all those wounded in combat are recorded as wounded in action. This appears to be true in every army for which we have collected casualty data (the U.S., UK, German, Soviet, Italian, French, Israeli, Egyptian, Jordanian, and Syrian armies and for UN forces).

However, it does not appear to hold true for the U.S. Marine Corps. In the case of the U.S. Marine Corps every Marine who qualified for a Purple Heart is recorded as having been wounded in action. In the case of the other armies, wounded are counted as all those who required a certain defined level of medical treatment, dispensed at a certain medical echelon. For example, for most of the nations in World War II "wounded in action" were defined as those wounded who were evacuated to a medical facility outside of the division. Therefore, for the U.S. Army, between 20 and 30 percent of those otherwise qualified for a Purple Heart (since all wounds, however slight, qualified a soldier for the award) were not counted as wounded in action, since they did not spend a night in a division or higher-level aid station. These casualties were often recorded as CRO, meaning "Carded for Record Only," and were not included in medical wound statistics (or were included without explanation, further clouding the issue). This category of "wounded in action," which we refer to in this study as "lightly wounded, minimal care required," does not require any significant medical resources and is not counted in the reporting of most armed forces.

The confusion arises in that each army interprets "wounded in action" differently (and occasionally different elements of the same army interpret "wounded in action" differently). The definition can also vary depending on what is considered to constitute admission to a hospital. The actual count of wounded is further influenced by custom and habit. As a general rule the U.S. and the UK have similar definitions and habits, and therefore wounded data for them can be compared directly. In the U.S. Army in World War II however, some confusion exists because the definitions were subject to differing rules in the different theaters of operations. The Germans were more restrictive and precise in their definition. They may well have underreported wounded by 20 or 30 percent for the same population that would all have been counted as wounded by the U.S. or UK medical system. For the Soviet army, custom and poor medical facilities resulted in fewer soldiers seeking hospital aid, even though they may well have needed it. As a result the Soviets had a noticeably lower rate of wounded-in-action reported. Still, all these systems probably reported the actual number of wounded-in-action to within 50 percent of each other, for a given population. The number of total casualties reported was probably within 20 to 30 percent of each other (considering that 60 to 80 percent of the casualties were wounded).

Unfortunately, when it came to the reporting of wounded EPW the criteria was apparently even less well defined. However, if the EPW received the exact same treatment and care as did soldiers of the army that captured them, then this is not an issue. If habit, policy, or the situation meant that the prisoners had a lower priority on care, then one could almost certainly assume that the lightly to moderately wounded prisoners were not reported as wounded and may not have received any medical care other than first aid. As the reports written do not provide a detailed definition, it is unknown exactly who they include as wounded, and since the general definition of wounded is so poorly understood the percent of the actual wounded population actually referred to is unknown.

Still, this is a problem that only yields large numerical differences only in the most extreme situations. Therefore, it is not considered a major issue in this analysis. Still, in almost all cases, if EPW are given the same priority as friendly casualties, then the actual workload will in fact be slightly higher than the estimates given in this study.

### Percent of Captured Who Are Wounded

Source	Dates	EPW	Casualties	Percent
US 90th Division G-2 reports	10 Jun - 31 Aug 1944	15,893	2,141	13.47*
US 90th Division G-3 report	8 Jun - 31 Oct 1944	21,617	2,092	9.68*
3rd (Canadian) Infantry Division	6 Jun 1944	47	2	4.26
1st (Canadian) Parachute Bn	6 Jun 1944	84	6	7.14
US II Corps	10 Jul - 17 Aug 1943	29,514	645	2.19**
First (British) Army	8 Nov - 28 May 1943	3,862	338	8.75**
First (British) Army	8 Nov - 28 May 1943	4,618	1,351	29.26
Fifth (US) Army	23 May - 2 Jun 1944	7,004	606	8.65
12th (US) Army Group	9 Dec 44 - 26 Jan 45	56,522	1,233	2.18***
12th (US) Army Group	17 Dec 44 - 20 Jan 45	41,474	2,464	5.94***
<b>Totals</b>		<b>180,835</b>	<b>10,878</b>	<b>6.02</b>
			<b>Average:</b>	<b>9.15</b>

\* These two reports over-lap. The G-3 report is accepted over the G-2 report.

\*\* Prisoners are mostly Italian

\*\* Reports are incomplete and overlapping

This is a fairly unsophisticated listing. The unweighted average of 9.15 is meaningless. If this list is modified to delete the overlapping cases (of which there is one), the incomplete 12th (US) Army reports, and the two cases in which over 90 percent of the prisoners were Italian, then the remaining EPW are almost exclusively German.

### Percent of Captured Who Are Wounded (German)

Source	Dates	EPW	Casualties	Percent
US 90th Division G-3 report	8 Jun - 31 Oct 1944	21,617	2,092	9.68
3rd (Canadian) Infantry Division	6 Jun 1944	47	2	4.26
1st (Canadian) Parachute Bn	6 Jun 1944	84	6	7.14
First (British) Army	8 Nov - 28 May 1943	4,618	1,351	29.26
Fifth (US) Army	23 May - 2 Jun 1944	7,004	606	8.65
<b>Totals</b>		<b>33,370</b>	<b>4,057</b>	<b>12.16</b>
			<b>Average:</b>	<b>11.80</b>

It is clear that the aggregate German data indicates that about 12 percent of the captured were wounded. Twelve percent is consistent with all of the other data found and, for the lack of any other reasonable estimate, is the recommended figure. As a comparison of the medical workload generated by a less combat effectiveness force, in this case the Italians, we have the following two cases:

### Percent of Captured Who Are Wounded (Italian)

Source	Dates	EPW	Casualties	Percent
US II Corps	10 Jul - 17 Aug 1943	29,514	645	2.19
First (British) Army	8 Nov - 28 May 1943	3,862	338	8.75
<b>Totals</b>		<b>32,342</b>	<b>983</b>	<b>3.03</b>
			<b>Average:</b>	<b>5.47</b>

This would imply that when facing a "less capable" force, the percent of CIA that are wounded would be less than 12 percent, and may be as low as 3 percent.

#### Percent of Captured Who Are Wounded (Soviet, Kursk)

	Total Captured	Total Wounded	Died of Wounds
Total Troops	16,557	2,794 (16.88%)	25 (0.89%)
Officers Only	607	39 (6.43%)	--

This was also an example of a "less capable" force. However, clearly the Soviets had a higher percent of wounded than did the Germans in the other examples. One can only conclude that a low wounded-in-action rate is only one aspect of a force that is "less capable" and that not all "less capable" forces will show a low CIA rate.

#### A. Degree of Medical Workload (Measuring Percent of Wounded that are Captured)

This analysis examines the real burden that is placed on medical resources by EPW, relative to the overall medical burden (that is, as proportion of friendly casualties treated). The examples collected show:

#### EPW as a Percent of Total Medical Workload

	Dates	Friendly POW Casualties	EPW Casualties	Ratio	% Workload is EPW
US 90th Infantry Division	8 Jun - 31 Oct 44	12,958	2,092	6.19	13.90
US II Corps	10 Jul - 17 Aug 43	11,415	645	17.70	5.35
Fifth (US) Army	23 May - 2 Jun 44	8,475	606	13.98	6.67
12th (US) Army Group	9 Dec 44 - 26 Jan 45	60,863	1,233	49.63	1.99 *
<b>Totals</b>		<b>93,711</b>	<b>4,576</b>	<b>20.48</b>	<b>4.66</b>
				<b>Average</b>	<b>6.98</b>

\* Data is admission to UK hospitals and is therefore a subset of wounded. As such, it most likely gives a biased picture.

If we delete the 12th Army Group data, which may be anomalous, then:

#### EPW as a Percent of Total Medical Workload (minus 12th Army Group)

	Dates	Friendly POW Casualties	EPW Casualties	Ratio	% Workload is EPW
US 90th Infantry Division	8 Jun - 31 Oct 44	12,958	2,092	6.19	13.90
US II Corps	10 Jul - 17 Aug 43	11,415	645	17.70	5.35
Fifth (US) Army	23 May - 2 Jun 44	8,475	606	13.98	6.67
<b>Totals</b>		<b>32,848</b>	<b>3,343</b>	<b>8.83</b>	<b>9.24</b>
				<b>Average</b>	<b>8.64</b>

Thus, in intense conventional combat, less than 10 percent of the medical workload will be caused by wounded EPW. This means that representing the increased workload caused by EPW could simply be accomplished by adding 10 percent to the currently modeled medical workload.

This of course assumes intense conventional combat. Obviously, if the intensity of combat is much lower, then the percent of wounded EPW could change. However, this is irrelevant since the system should be capable of dealing with requirements that are less than those based upon heavy conventional combat.

## **B. Wounded That May Require Immediate Medical Attention**

In the data collected above, the statistics on the wounded EPW certainly do not include the lightly wounded who do not require hospitalization. They may also not include some lightly and moderately wounded who in normal circumstances (i.e., if they had not been captured) would have been treated in a hospital and in fact may have spent several days there. We are fairly certain that the statistics above account for all EPW who needed immediate medical attention as well as some that did not. The number of those who did not need immediate medical attention is simply not known. Additionally it is understood that many prisoners may undergo considerable deprivation and may be weakened before capture, some of them may also need medical attention. These are normally subsumed in the numbers above, but in extreme cases like the Gulf War, they can be quite a large group.

As a result of the limitations of the data, we have adopted the phrase "may require immediate medical attention." This is assumed to entirely encompass the population described in the above statistics. Since the purpose of this analysis is to determine what additional medical workload is caused by wounded EPW, the question then becomes what is the necessary burden at the peak use of the facilities. If the facilities are stressed to the maximum, then one certainly will expect that wounded-in-action will be triaged and only those in need of immediate medical attention will be treated. If the medical workload is higher, then certainly fewer wounded cases will be treated immediately.

Therefore, "may require immediate medical attention" is probably a valid indicator of the absolute requirements that must be addressed to insure humane treatment of prisoners of war.

However, this does not guarantee 100 percent immediate medical treatment for all EPW. It is well understood that because casualties tend to occur in "rushes," any medical system employs triage to prioritize casualties, be they enemy or friendly troops. As such, the EPW wounded-in-action data is considered to be a reasonable representation of the immediate medical requirement of EPW.

## **C. Interim Conclusions**

These conclusions are based upon a relatively unsophisticated analysis of the data. More sophisticated analysis will follow, but these basic working conclusions may be assumed.

- When facing a "modern motivated army," one may expect that about 12 percent of the EPW captured "may require immediate medical attention."

- When facing a "less capable army," one may expect that as little as 3 percent of the EPW captured "may require immediate medical attention." However, since the number of EPW captured in this situation is often quite large, the total number of EPW that "may require immediate medical attention" may in fact be quite large.

- In intense conventional combat, less than 10% of the medical workload may be caused by captured EPW.

#### **D. Peak Admission Rate**

As far as medical workload is concerned, the issue is not usually the average admission rate, but is rather the peak admission rate. In order to provide effective care, a medical facility must be able to deal with critical cases during peak periods. As the peak rate of admission of casualties is often well in excess of the average admission rate, then one must examine under what conditions these figures may be higher (lower is not a problem). Therefore we will examine the data to see if further insights can be developed.

Returning to the original issue, which was measuring the percent of EPW that are wounded, the aggregate figures need to be converted to a rate measured over time. In this case the figure used is a daily average. In some cases, this daily average was from a daily report, in many cases it was derived from five-day or weekly reports, and in some cases it is computed from a monthly report. Still, it provides a means of scaling the figure to some consistent measure. This revised data is provided in Appendix I since the analysis generated a null result. Only the conclusion from that analysis is repeated here:

*Without further research, there appears to be no correlation between increases in the number captured and changes in the percent of captured that are wounded. Therefore, until more in-depth research establishes the pattern one way or the other, one is safe using a constant value for percent of wounded captured.*

Next we address the second issue, which was measuring the percent of wounded that are captured. In this case, the question was whether as the total number of friendly wounded increases (implying more intense combat), does the percent of enemy wounded who are captured also go up? If this is the case, then the workload caused by intense combat may be magnified by more than the 10 percent additional workload caused by the captured wounded. This is tested in Appendix II. Again it produced a null result; the conclusion is presented below:

*Without further research, there appears to be no correlation between increases in the number of friendly casualties treated and changes in the percent of treated casualties that are prisoners of war. Therefore, until more in-depth research establishes the pattern one way or the other, one is safe using a constant value for percent of medical workload caused by enemy prisoners of war.*

## Conclusions

The conclusions presented in this study are:

- When facing a "modern motivated army," one may expect that about 12 percent of the EPW captured "may require immediate medical attention." This percentage does not appear to vary as the total number of EPW captured varies.
- When facing a "less capable army," one may expect that as little as 3 percent of the EPW captured "may require immediate medical attention." However, since the number of EPW captured in this situation is often quite large, the total number of EPW that "may require immediate medical attention" may in fact be quite large. This percentage does not appear to vary as the total EPW captured varies. Also, not all "less capable armies" have a lower wounded-in-action rate than "modern, motivated armies." While a low wounded-in-action rate is most likely a sign of a "less capable army," not all "less capable armies" display this characteristic.
- In intense conventional combat, less than 10% of the medical workload may be caused by captured EPW. This percentage does not appear to vary as the total casualties to be treated varies. It can be higher if the opposing force is "stubborn" in the defense.
- The medical workload caused by EPW can be reasonably predicted for "modern motivated armies" by using existing models with the percentages provided in this report.
- The medical workload caused by EPW cannot be reasonably predicted for "less capable armies" unless the models are revised to fully reflect human factors (see the Report for Phase III for a detailed explanation of the rationale behind this conclusion).



## **Final Comments**

The fundamental problem that needs to be corrected in the combat modeling community is the inability to correctly model less capable armies. Until the models currently in use are revised to fully reflect the effect of human factors (casualty rates, the force ratio required for success, the degree of operational and tactical success or failure, the number of EPW surrendering, and so on) they will have problems addressing the EPW capture rate for less capable forces.

As shown in the Phase I & II Final Report and the Phase III Final Report, measuring human factors is not difficult. We have also pointed out some of the ways less capable forces are different from and perform differently than modern motivated armies. We have also been able to point to ways of predicting the combat ability of forces before the shooting starts, or soon after it does start. In the case of this particular study, the percent of surrendered who are wounded may serve as the basis for being able to measure or estimate human factors, morale, motivation, unit cohesion, etc.

As such, the obvious next step is to create a system that can be applied to an existing combat model that will serve to address the performance differentials between modern motivated armies and less capable forces. Such a system would not only address capture rates, but would also address casualty rates and degree of tactical success.

## Daily Capture Rates

US 90th Division G-2					
Data Point	Daily Average of Total POWs	Daily Average of Total Casualties	Percent	# Days Covered	
1	18	0.5	2.78	6	
2	71.67	6.17	8.6	6	
3	12.44	0	0	9	
4	92.4	14.2	15.37	10	
5	12.9	1.9	14.76	21	
6	245.8	1.4	0.57	5	
7	692.89	78.06	11.27	18	
8	43.38	0	0	8	

Or to place the same data in order of daily average captured:

US 90th Division G-2					
Data Point	Daily Average of Total POWs	Daily Average of Total Casualties	Percent	# Days Covered	
3	12.44	0	0	9	
5	12.9	1.9	14.76	21	
1	18	0.5	2.78	6	
8	43.38	0	0	8	
2	71.67	6.17	8.6	6	
4	92.4	14.2	15.37	10	
6	245.8	1.4	0.57	5	
7	692.89	78.06	11.27	18	
Mean:	148.69	12.78	6.67		
Median	57.53	1.65	11.38		

At least from the 90th ID data, there is no clear connection between the capture rate (as measured by total count) and the percent wounded. Still, three of the four cases that were higher than the median percent value were also in the four highest average captured rates. Because the G-3 reports were monthly, they were not used for this analysis.

The same test was also done from the British First Army weekly summaries of German prisoners.

### British 1st Army Weekly Summaries (German)

Data Point	Daily Average of Total POWs	Daily Average of Total Casualties	Percent	# Days Covered
1	5.76	1.03	17.86	34
2	8.57	2.43	28.33	7
3	6.43	1.43	22.22	7
4	3.14	1.14	36.36	7
5	4.07	1.43	17.54	14
6	3.43	0.5	14.58	14
7	4.71	0	0	7
8	15.14	1.71	11.32	7
9	3.71	0	0	7
10	2.29	0	0	7
11	10.29	10.28	100	7
12	38.9	6.05	15.54	21
13	2.29	0.43	18.75	7
14	8.57	0.14	1.67	7
15	44.86	6.86	15.29	7
16	36	14.71	40.87	7
17	93.71	22.71	24.24	7
18	34.57	14.43	41.74	7
19	65.57	6.71	10.24	7
20	161.14	84.43	52.39	7

Or to place the same data in order of daily average captured:

### British 1st Army Weekly Summaries (German)

Data Point	Daily Average of Total POWs	Daily Average of Total Casualties	Percent	# Days Covered
10	2.29	0	0	7
13	2.29	0.43	18.75	7
4	3.14	1.14	36.36	7
6	3.43	0.5	14.58	14
9	3.71	0	0	7
5	4.07	1.43	17.54	14
7	4.71	0	0	7
1	5.76	1.03	17.86	34
3	6.43	1.43	22.22	7
14	8.57	0.14	1.67	7
2	8.57	2.43	28.33	7
11	10.29	10.28	100	7
8	15.14	1.71	11.32	7
18	34.57	14.43	41.74	7
16	36	14.71	40.87	7
12	38.9	6.05	15.54	21
15	44.86	6.86	15.29	7
19	65.57	6.71	10.24	7
17	93.71	22.71	24.24	7
20	161.14	84.43	52.39	7
Mean:	27.66	8.82	23.45	
Median	8.57	1.57	17.7	

Again, the evidence of a pattern is weak. Six of the ten highest values for the percent captured are in the top one-half of the total captured.

The same test was also done for the British First Army weekly summaries of Italian prisoners, which are assumed to reflect an army with poor morale, motivation, or cohesion.

<b>British 1st Army Weekly Summaries (Italian)</b>				
<b>Data Point</b>	<b>Daily Average of Total POWs</b>	<b>Daily Average of Total Casualties</b>	<b>Percent</b>	<b># Days Covered</b>
1	10.86	0.53	4.88	34
2	3.43	0	0	7
3	1	0.29	28.57	7
4	0.43	0	0	7
5	0	0	0	14
6	15	1	6.67	7
7	0.57	0	0	7
8	10.14	0	0	7
9	13.57	0	0	7
10	7.71	0.28	3.7	7
11	17.14	0.28	1.67	7
12	32.71	1.71	5.24	7
13	20.43	0.05	0.23	21
14	0.43	0.43	100	7
15	91	5.29	5.81	7
16	3.14	0.57	18.18	7
17	4.71	4.29	90.91	7
18	79	0.86	1.08	7
19	21.43	0.71	3.33	7
20	2.71	1.71	63.16	7
21	37.29	8.43	22.61	7
22	110.57	19.71	17.83	7

Or to place the same data in order of daily average captured: (see next page)

British 1st Army Weekly Summaries (Italian)					
Data Point	Daily Average of Total POWs	Daily Average of Total Casualties	Percent	# Days Covered	
5	0	0	0	14	
4	0.43	0	0	7	
14	0.43	0.43	100	7	
7	0.57	0	0	7	
3	1	0.29	28.57	7	
20	2.71	1.71	63.16	7	
16	3.14	0.57	18.18	7	
2	3.43	0	0	7	
17	4.71	4.29	90.91	7	
10	7.71	0.28	3.7	7	
8	10.14	0	0	7	
1	10.86	0.53	4.88	34	
9	13.57	0	0	7	
6	15	1	6.67	7	
11	17.14	0.28	1.67	7	
13	20.43	0.05	0.23	7	
12	32.71	1.71	5.24	7	
21	37.29	8.43	22.61	7	
18	79	0.86	1.08	7	
15	91	5.29	5.81	7	
22	110.57	19.71	17.83	7	
Mean:	21.97	2.19	16.99		
Median	10.50	0.48	4.29		

Again, the evidence of a pattern is weak. Six of the eleven highest values for the percent captured are in the top one-half of the total captured.

Still, in attempting to locate a pattern one notes that in all three sets of data (US 90th ID, UK 1st Army [German], and UK 1st Army [Italian]), there are no cases in which the average number captured per day is between 22 and 32. As such, the data provides a convenient breakpoint between a low capture rate and a high capture rate. In this case we then looked at the average capture rate and the weighted capture rate for each of the three cases, based upon low or high captures.

Percent Captured		Low Capture Rate		High Capture Rate	
Data Set	Cases	Mean	Median	Mean	Median
90th ID	3 & 5	5.85	2.78	7.16	8.60
1st Army (German)	13 & 7	20.66	17.54	28.62	24.24
1st Army (Italian)	17 & 5	18.90	3.33	10.51	5.81

Of course, the pattern one was expecting to see is that when capture rates increase, the percent of wounded EPW decreases. In fact, in most cases the data shows the reverse, meaning that as the number of captures go up, the percent of captured wounded goes up. This is counter-intuitive.

#### Conclusion:

Without evidence derived from further research, there appears to be no correlation between increases in the number of EPW and changes in the percent of EPW that are wounded. Therefore, until more in-depth research establishes the pattern one way or the other, one is safe using a constant value for percent of wounded EPW.

## Casualty Rates versus EPW Treated

Again, the issue is whether the number of wounded EPW, as a percent of the total population of EPW, increases as casualties (or intensity) increase. To attempt to determine this, we measured the daily average rate of friendly casualties and compared it to the percent of casualties that were EPW.

Again we used only that data in which we had confidence: the data for the US 90th ID, the US II Corps, and the 5th US Army. The 12th US Army Group data was not used for a number of reasons, one being that the percent of casualties flown to England from the Continent was certainly influenced by the weather and availability of air transport.

The data shows the following:

Data Point	Daily Average Friendly Casualties	Daily Average of PW Casualties	Percent	# Days Covered
1	136.65	3.09	2.21	23
2	144.52	4.87	3.26	31
3	55.16	53.71	49.33	31
4	67.20	6.17	8.41	30
5	51.90	0.65	1.24	31
6	292.69	16.54	5.35	39
7	663.70	47.30	6.65	10
8	1141	46	3.88	1
9	697	87	11.10	1

Or to place the same data in order of friendly casualties:

Data Point	Daily Average Friendly Casualties	Daily Average of PW Casualties	Percent	# Days Covered
5	51.90	0.65	1.24	31
3	55.16	53.71	49.33	31
4	67.20	6.17	8.41	30
2	144.52	4.87	3.26	31
1	136.65	3.09	2.21	23
6	292.69	16.54	5.35	39
7	663.70	47.30	6.65	10
9	697	87	11.1	1
8	1141	46	3.88	1

Again, no pattern clearly presents itself. With only nine points of data, there is no reason to do statistical testing or further analysis of this data.

**Conclusion:**

Without evidence derived from further research, there appears to be no correlation between increases in the number of friendly casualties treated and changes in the percent of treated casualties that are EPW. Therefore, until more in-depth research establishes the pattern one way or the other, one is safe using a constant value for percent of medical workload caused by EPW.